

XIV.—*On the Marine Testacea of the Piedmontese Coast.*

By J. GWYN JEFFREYS, Esq., F.R.S.

[With a Plate.]

THE conchology of the British islands having been nearly exhausted by the excellent work of the late Professor Edward Forbes and Mr. Hanley, I had no wish to glean the small handful that remained in that field; and I therefore determined to spend part of my "long vacation" in exploring another district, in which my former labours and experience might prove useful to me. My original intention was to visit Sardinia, the fauna of which island is but little known, although its scenery and antiquities, as well as the habits of its people, have been so well described, and invested with so much interest, by the book of my friend Mr. Tyndale; but this intention was frustrated by a regulation which I was informed on my arrival in Italy had been recently made for putting all sea-borne travellers from the mainland in quarantine for five days, by reason of the prevalence of cholera at Genoa and Leghorn. This would have effectually marred the prosecution of my design; and I therefore, but with reluctance, gave it up. Another plan which I had formed as an alternative before leaving England, was to explore that part of the Riviera which lies between Genoa and Portofino on the east. This I subsequently carried out, and extended by excursions in the same direction to Sestri di Levante and Spezia, thus including about sixty miles of sea-coast; and ultimately, through the assistance of the Chevalier Verany (the well-known author of one of the most finished *livres de luxe* which ever emanated from a scientific pen—his work on the Mediterranean Cuttles), I made myself acquainted with the testaceous mollusca or shell-fish of the whole of the Piedmontese sea-board, extending from $43^{\circ} 40'$ to $44^{\circ} 25'$ of north latitude between Nice and Genoa, and from $7^{\circ} 10'$ to 10° of east longitude between Nice and Lerici. It is, with the exception of the Gulf of Venice, the most northerly section of the Mediterranean, and is situate in nearly the same parallel of latitude as the lower part of the Bay of Biscay.

I believe I was the first who ever "dredged" this part of the Mediterranean; and as a short account of the adventure may be useful or interesting to other naturalists, I trust I may be excused in prefixing it to the more scientific portion of this communication.

To transport dredges, sieves, and other conchological apparatus across the continent, and afterwards to work in a small felucca, with the aid of Italian boatmen who never saw a dredge

or a conchologist before, and whose *patois* it was very difficult to understand, is quite a different affair from having, like my friend Mr. M'Andrew, a well-found yacht with a crew of trained and semi-conchological seamen; to say nothing of the heat, dirt, and insects which render an autumnal lodging in any town on the Mediterranean coast anything but comfortable. Although I do not possess one-half of the qualities which Mr. Kingsley attributes to a model field or out-door naturalist, I was often obliged to "rough it." The first difficulty I had to surmount was in "clearing" my dredges and sieves at the custom-house on my arrival in Paris. The ordinary searchers could make nothing out of these outlandish articles, and referred to the superintendent, who, after further investigation and inquiry, decided that they were "machines," and therefore liable to duty. After some further explanation, however, I succeeded in inducing him to reconsider and alter his decision, and I escaped any payment. Still greater, and more frequent trouble awaited me on my journey homewards, in getting my cargo of shells passed by the douaniers on the Lago Maggiore, and in Switzerland and France; but I had no reason to complain of our own custom-house officers.

I started from London on the 1st of August, 1855, and went to Genoa, *via* Paris, Lyons, Chambéry and Turin; this being the most direct and expeditious, as well as the cheapest, route. At Genoa I succeeded in getting a boat with two men for six francs a day, exclusive of the hire of ropes, for which I had to pay a like sum; and this made my dredging there expensive, besides not being able to do much work, in consequence of having to get out of the port and offing on each occasion. The best ground I met with there was off Foci (two or three miles east of Genoa), in about forty fathoms water. After staying at Genoa three or four days, I took the steamer to Spezia, where I arrived after a boisterous voyage of sixteen hours, the distance run being not much more than sixty miles. I there put up at a tolerable inn, called the Hotel de l'Univers, where I made the usual preliminary bargain, and got a good-sized bedroom, with café au lait, bread and butter for breakfast, the table d'hôte dinner, and café noir in the evening, for five lire di moneta regia (or four shillings) per day, besides wax-lights and attendance. The former I bought at a shop; and I paid a lire per day altogether for attendance. The table d'hôte was, during the first week of my stay at the inn, tolerably well filled, ten or a dozen guests being the average number; but the company afterwards dwindled away to such an extent, that an officer in the Piedmontese army (Captain Chiavarini, whose civility I shall not easily forget) and myself were the only guests; and on one

occasion I formed the whole of the company, and had a solitary dinner. Immediately on my arrival at Spezia I engaged a boatman, and was so well pleased with him that I continued to employ him during the whole of my stay there. His name was Giovanni Solese, and I can safely recommend him to any brother naturalist who may be inclined to follow in my footsteps. He was a middle-aged and short but active man, with fine dark eyes, and a most intelligent and benevolent countenance. His "moglie" kept a small shop, and let lodgings; and in the winter he worked at his other trade of a blacksmith. Solese's mate or fellow-boatman was, at first, his brother, a taller man, who wore large ear-rings, and was rather taciturn; but he was succeeded by an ancient mariner, who told me he recollected "Napoleone il grande" coming to Spezia, where it is well known he intended to form a magnificent harbour for his Mediterranean fleet. I had not much difficulty in arranging terms with the boatman; and I was well satisfied at having to pay only five francs per day for the boat, men, and 100 fathoms of rope, being less than half of what I paid at Genoa. My knowledge of the Italian language being very rudimentary, I had of course at first some trouble in explaining to the men the use of a dredge and the mode of working it, and this I did chiefly by means of signs; but, after a day or two, my "cacchiate," "basta," and "tirate" were understood perfectly well; and the men dredged and sifted the soil without me on the alternate days, when I was obliged to stay indoors to examine the produce of the preceding day, as well as to clean and arrange the specimens. It was, I can assure my readers, very hard work, from seven or eight in the morning until five in the evening while dredging, and sometimes till near midnight indoors. My usual practice on dredging-days was, after working with and directing the men until noon, to land on some part of the coast, bathe off the rocks, and then walk back to the little town, conchologizing along the shore on my way; the men in the meanwhile continuing to dredge some previously explored part of the Gulf in accordance with my directions. The modes of collecting which I adopted were three:—1st, by the dredge. Of these I took two with me. The larger one was of iron, and twenty-two inches wide at the mouth or opening, with an outer net or bag of rope-yarn fastened to the mouth of the dredge by strips of raw hide, and an inner and close-meshed net of twine. This dredge had a safety-chain attached to it, to assist in disengaging the dredge in case of its getting foul of a submarine rock. The other, or smaller dredge, was only about a foot wide, and was made of galvanized iron, with a flexible chain of the same material instead of the usual arms riveted by bolts and nuts. It was made for me,

under the superintendence of Professor Robert Ball of Dublin, and answered pretty well for experimental or deep-sea dredging, but in my opinion it is not sufficiently capacious or heavy for ordinary work. The net for this dredge was single, and of close-woven twine. All the nets had been tanned, to prevent rotting. In such distant expeditions it is of course advisable to have a second dredge, in case of losing one. My sieves, which I took in a case, under lock and key, were six in number, and lined with brass wire of different degrees of fineness. The largest measured about twelve inches in diameter. They are, I need scarcely say, indispensable in the collection of the smaller shells. While dredging, I always had a large tub in the boat to wash the soil, as the sea was never sufficiently calm for that purpose, and it obviated any risk of losing the sieves overboard. 2ndly, from sea-weed. By this mode I obtained a great number and variety of the littoral shells, such as *Rissoa*, *Skenea*, and *Scissurella*, which inhabit and feed on the sea-plants and confervæ that so abundantly clothe the rocks, and are submerged at low water, or while the sea breeze blows inshore. The plan I adopted was, to collect in a bag or pocket-handkerchief a quantity of the sea-weed and coralline with their roots (and while bathing I had especial opportunities) from different depths; and on returning to my room I steeped the whole in my sieves for some time in a tub of *fresh* water, by which means the animals appeared to be instantaneously killed, and dropped into the sieves. These were then shaken over sheets of paper, and the contents were exposed to the sun and dried, and afterwards carefully sifted and separated from the stalks of sea-weed and larger shells. The examination of the residuum, which almost entirely consisted of minute shells, as well as the sorting and arrangement of the specimens, took up a great deal of my time, but amply rewarded me for the trouble. The 3rd, being the ordinary mode used by collectors, was by picking up shells on the sea-shore. The tides in the Mediterranean being so feeble and irregular, there was not at Spezia a line of "spolia marina," such as we see on the sandy shores of Great Britain; but by wading a little, and examining the under side of loose stones, I found a great many live shells which I never met with in my own country, such as the *Conus Mediterraneus*, and several species of *Trochus*, *Patella*, *Columbella*, *Vermetus*, and *Pollia*.

Twice I made excursions to the Island of Palmaria, at the entrance of the Gulf. I also went to Lerici (near which, on the beach, stands the house formerly occupied by Lord Byron and Shelley), and San Bartolomeo on the eastern, and Porto Venere on the western shore. The Gulf or Bay of Spezia is about seven miles in length, and varies from three to five miles

in breadth. The tide recedes (for the Mediterranean, considerably) from its head or upper end, laying bare a large tract of sand. Farther seawards is a fringe or belt of *Zostera marina* (or Sea Riband), which appears to be a favourite haunt of the *Murex Brandaris* and *trunculus*, as well as of our common sand-eel (or *anguille* of the Italians), the *Muraena marina* of ichthyologists. Beyond this, to a depth of twelve fathoms, is a variety of ground; a great part being covered with *Zostera* and other kinds of sea-weed, another part being gravelly with occasional patches of shell-sand, another being rocky, and the rest stony and favourable for the growth of sponges and corals. The sponge and coral of commerce are not, however, found on that part of the coast. One day's dredging I devoted to the examination of a remarkable spring of fresh water which rises about fifty yards from the western shore of the Gulf, and is of such an extraordinary depth and volume as to be visible at a considerable distance, and even dangerous to small boats. It resembles *in petto* the Corrievreckan on the Scotch coast. I made two or three hauls in the vortex and round the edges of the spring, but got nothing except dead shells of littoral species, which must have been washed off the shore by the tide and waves and absorbed into the whirlpool. It is said that Napoleon the First had an idea of using the water of this spring for his projected harbour. On my dredging-days I always had a plunge into the bright and deep blue sea, either from the boat, or from a rock after I landed; but the difference of temperature between the atmosphere and water was too slight to make it a refreshing or invigorating process, there being no reaction after bathing. On one occasion this amusement had more of fright than refreshment in it. I had swum out from the rocks at Palmaria, leaving the men to moor their boat, and was returning, when I heard loud cries of "Guarda, guarda, signore!" I fully expected that a white shark (which Admiral Smyth describes in his list of Mediterranean fishes as "the most voracious of human food of all fishes") wished to make my acquaintance, or see whether the flesh of a Welshman was as good-eating as that of an Italian; and having somewhere read or heard that they were cowardly as well as greedy, I splashed about in the water as much as I could until I reached land, and then I understood what the boatmen meant by their caution. It was to look where I trod when I touched ground, because (as I then perceived) the rocks were stuck all over with a large sea-egg (*Echinus esculentus*), which might have lamed me if the sharp and stout spines with which they are armed had penetrated the sole of my foot. The men were at the time busy in collecting a quantity of this delicacy for home consumption.

I had not before tasted sea-eggs, although this large and edible kind is not uncommon on the Devonshire coast; but, on being persuaded by the men to do so, I certainly did not disapprove of their taste. The only part which is eaten are the lobes at the side. The flavour is peculiar and indescribable; and I can only compare it to something between an oyster and guava jelly. The substance is pulpy, and appears to melt in the mouth. The fishermen are very fond of all kinds of shell-fish, cuttles, and crustacea, the first of which they call "frutti di mare."

Outside the Gulf is deep water; but I was disappointed in my dredging there. For several leagues seaward, in from fifteen to fifty fathoms, I met with nothing but tenacious mud (which my boatmen called "fango"), with *Turritella communis* and a curious variety of *Calyptrea sinensis*, which moulded itself and adhered to the last whorl of the *Turritella*.

I found the heat much greater indoors than on the water, as might have been expected. On the land it was seldom less than 78° Fahr. in the shade. The boat was furnished with the usual awning, which extended over about two-thirds of it; but this I generally had taken down on reaching the dredging-ground to facilitate operations, and the only inconvenience I felt was from the perpendicular rays of the sun at noonday, which my "wide-awake" scarcely warded off. But in my room it was often very uncomfortable, because I could not follow the usual custom of closing the shutters and excluding all the sunlight, inasmuch as I should not in that case have had sufficient light to examine the smaller and almost microscopic specimens; but I was always obliged to strip myself of my coat and waistcoat. This, with the aid of the narrow streets and tall houses, gave me some little relief.

At Palmaria, the fishermen eke out their precarious livelihood by extracting the "dati di mare" (*Lithodomus dactylus*) from the limestone rocks which engird that island. This is done by means of a crowbar; and the fisherman is often several hours in the water, up to his middle, breaking the rock in search of the shell-fish, which he collects in a bag tied round his waist. This molluscous luxury fetches on the spot no less than four francs per hundred, and is sent by the steamers to Genoa and Leghorn. At Porto Venere, which is situate on a promontory at the western entrance of the Gulf, I observed a great many dealers in this article; the shell-fish being kept in pans of sea-water in dark cupboards. It appears to be the only foreign trade possessed by that ancient Roman town, which is so full of archways and picturesque ruins. It must not be imagined that a naturalist only uses his eyes for his own proper objects. His soul, "steeped in beauty" by the continual contemplation of the

graceful and varied forms of Nature, is not insensible to artistic objects, although the angular works of his fellow-man cannot for one moment be put into competition with the "teres atque rotundus" which is the character of natural forms.

While I was at Spezia, the land breeze or "vento di terra" regularly set in from about 2 A.M. to 2 P.M., and the sea breeze or "vento di mare" blew inshore during the rest of the twenty-four hours. The first enabled mine and all the other boats and vessels to leave the little port and get a good offing, while the other cooled and refreshed the parched land and its inhabitants. Sometimes a sudden squall, caused by a wind called the "borasco," would arise, especially under high land, and made my short voyages not quite free from danger.

Although I am not a botanist, I could not help being struck with the prodigality of Flora in throwing her charms around this beautiful country. The coast was fringed with myrtle; and the olive-groves, being unpruned, had a much less stiff appearance than in the South of France. The grape-crop had again failed, but the vines, still faithful to their ancient husbands, spread their festoons and garlands as of old.

Through the kindness of my table-d'hôte companion (for I knew no one else, and did not meet with one of my countrymen during my stay at Spezia), I had an opportunity of joining some fishing-parties; and, as it is indirectly connected with my subject, I will endeavour to describe one of them. My dredging boat and crew (which were among the best in the place) were selected for the occasion, and at 9 P.M. the party met on the pier and embarked, having either a small lanthorn suspended inside the awning, or the moon when she was up and propitious. Our party consisted of half-a-dozen ladies and gentlemen. The boatmen rowed slowly to the fishing-ground while the ladies sung, and on reaching a cork buoy to which the lines were attached (which sometimes it took a long time and a considerable circuit to do, owing to the small size of the object and the difficulty of finding it), the sport commenced. There were about 150 hooks attached to lines about two feet in length, which were fastened at intervals of about a fathom to the main line. This was attached at each end to the buoy. The lines had been set in the previous morning, the bait consisting of strips of fish and small blennies. While the lines were being taken up by one of the boatmen, the other holding water or rowing in the direction of the main line, there was of course no little excitement, mingled with disappointment when sometimes at every other haul a shell-fish (*Murex Brandaris* or *M. trunculus*) was taken. These are, like our *Buccinum undatum*, to which they appear to form analogues, carnivorous and frequently take the fishermen's bait.

The *Murex trunculus* yields a rich purple dye, and being common in the Mediterranean (although not known in higher latitudes), is probably the kind which the ancients made use of for that purpose, as well as for the table. The fish caught were grey mullet and sand-eels, some of the latter weighing two or three pounds. Supper was then prepared; and with the aid of a brazier of charcoal, frying-pan, oil and salt, our fish were soon cooked. A flask or two of native wine and some bread completed the repast, and we returned to shore about midnight.

I staid at Spezia three weeks, and had intended to return by the "Ferugio" steamer to Genoa, and try my luck again in deep water; but a seat in a return-carriage having been offered me by a vetturino, I gladly availed myself of it, and enjoyed the journey across the Apennines and along the Riviera di Levante. The route is beautiful and more varied than by the Cornice. My only *compagnon de voyage* was a Lombardese gentleman. We passed the night at Sestri di Levante, about halfway between Spezia and Genoa; and, while taking a stroll on the beach after dinner, I was so charmed with the place as well as satisfied with the prospect of its dredging capabilities, that I made a bargain at the inn and with a boatman, and determined to return thither from Genoa, where I expected to receive letters. To give some idea of Italian conscience, I may mention that one boatman asked me twenty francs per day for the use of his boat with ropes and two men, which I afterwards got for five francs, being the same rate as I paid at Spezia! The inn (Hotel de l'Europe) was very superior to the one I lodged at in Spezia, and I was "très-content" with the accommodation during my subsequent stay of ten days. I was, however, disappointed with the dredging; for, although the water was deep, and the shells that were thrown upon the beach gave great promise, the sea-bottom for leagues, as far as Portofino to the west and the Golfo de la Riva to the east, consisted of the same tenacious mud which I found outside of the Gulf of Spezia, and contained scarcely any other shell than the *Turritella communis*. I therefore again set to work in washing sea-weeds and examining the sifted produce; and as the inn was a large one, and I was for several days the only guest in it, I was enabled to work in comparative luxury by changing my room when the sun came round, and using a vine-clad balcony (having a circular marble table in the centre) which faced the east and commanded a view of the Apennines. The inn being built on the beach, I had thus the sea breeze, shade, and lovely scenery on both sides. It is certainly the most picturesque spot I ever visited. The fan-shaped *Padinia Pavonia* displayed its iridescent hues in the rocky pools; the tall aloë-flower caused incessant surprise; and the humble sand-convol-

vulus made my heart throb with recollections of home and its familiar shores.

At Spezia I had experienced great difficulty in cleaning the larger whelks and Mediterranean Cone, in consequence of the strength and size of the muscles which connect the soft parts of the animal with the shell in the zoophagous Mollusks; and, in spite of the chloride of lime which I was obliged to use pretty freely, my room was certainly not odoriferous in the sense I could have wished,—to say nothing of a large and strange sort of fly which was attracted by the decaying animal matter and bred abundantly in the drawers of my wardrobe, which I had turned into an extempore cabinet. But at Sestri I met with an ally which relieved me from this nuisance: it was a small red ant, that came in swarms from some secret hiding-place, and effectually cleaned out the shells in an incredibly short space of time. It appeared to be a species of *Atta*, probably *A. structor*; field-ants being known occasionally to become domestic. Their tenacity of life was surprising. I wished to bring home a couple of specimens for an entomological friend, and put them in boiling-water for several minutes; but some time afterwards the specimens (which I had dried and kept in a small box with a glass lid) were as lively as ever, and seemed not to be at all the worse for being parboiled.

The excessive saltness of the Mediterranean appeared to me evidenced at Sestri by the thick crust of salt-crystals which was formed on the rocks by evaporation from the sea-spray. I never noticed this on any part of the British coast. Lieutenant Maury, in his 'Physical Geography of the Sea,' states positively (§ 252) that the Mediterranean sea is not salting up; but the analysis of Dr. Wollaston would seem to lead to an opposite conclusion.

While engaged in my work of sifting sea-weeds and picking out the shells, I could not help reflecting on the immense loss of animal life which is (perhaps innocuously as well as unthinkingly) caused by naturalists. I found on my return to England that I had brought home with me upwards of 13,000 specimens of marine Testacea, and several thousands of land and freshwater shells, besides sponges and zoophytes! Of a species of *Rissoa*, which I have now described and figured for the first time under the name of *contorta* (an analogue of our *Rissoa striata*), I took between 1100 and 1200 specimens! These numbers are of course exclusive of multitudes which were thrown away, as I neither cared nor had time for collecting more. This wholesale destruction of life is on first consideration startling; but I consoled myself with thinking that if I had not taken and destroyed these animals for scientific purposes, some of their natural enemies would have made another use of them, and that if even

one-half of them had been allowed to die of old age or natural infirmities, the "balance of power" might have been deranged, and results which we cannot foresee might have ensued from the redundancy of particular species. Whether the handiwork of modern naturalists and collectors has any effect in altering the relative proportion of species is another question. "O Lord, how glorious are thy works : Thy thoughts are very deep !"

At Sestri I had the good fortune to meet with a fellow-countryman and brother lawyer (Mr. Thomas Smythe of the Chancery Bar), whose taste for science and art made his company very agreeable.

From Sestri I returned to Genoa and proceeded to Nice, having received a kind invitation from the Chevalier Verany to see him. I there went through and made notes of his collection of shells from that and the Genoese coast. It does not appear certain that Philippi, Risso, Payraudeau, or any other naturalist who has written on the Mediterranean fauna, ever used a dredge or sieve ; the mode which they probably adopted being to search the shores and drift-sand, or to procure the shells from fishermen and coral-divers. These methods, and especially the last, are obviously not well adapted to ensure the correctness of habitats and localities. M. Verany was, I have reason to believe, frequently deceived in the same way as our Colonel Montagu by the credulity or ignorance of others, and in investigating the question of geographical distribution, such errors frequently cause wrong conclusions.

From Nice I crossed the Col di Tenda to the Lago Maggiore, and paid a visit to a friend who had a villa on the borders of the Lake at Suna. I was much pleased with finding, in considerable plenty, the curious little snail, *Helix (Drepanostoma) Nautiformis*, and a white variety of it, on the hills in different parts of that district, as well as in the Val d'Anzasca. It has not been yet discovered on this side of the Alps. The animal is a true snail, and has two pairs of horns, with eyes, or their analogous organ, on the tips of the upper or longer pair. On the shores and in the shallows of the Lake, I found a species of *Limneus* or pond-snail, which appears to be the *Gulnaria lacustris* of Leach, in company with *L. auricularius*, and this induces me to believe that they are different species. Several kinds of *Pupa* and other land-shells, which had been previously noticed only on the hills which environ the neighbouring Lakes of Como and Lugano, also occurred to me. Collecting in these woods was not unattended with some risk, for they swarmed with different kinds of snakes. I more than once found, in searching the dead leaves and moss, that my hand was within an uncomfortable distance of a viper. In the Canero woods I one day

met with a large serpent, which lay stretched out at full length on a bed of fallen leaves. I at first thought it was dead, and raised it up by the middle with my stick; but the creature was only basking, and glided away. The peasants said this kind was "molto cattivo;" but I believe it was only the common snake of an extraordinary size. They also spoke of a small, but very venomous adder, not much thicker or larger than a man's finger, which would dart at, and kill, a dog. In a ravine behind Genoa, where I had been searching for *Paludina* in a brook, I saw an animal in the water under a large stone, which I at first took for an eel; but while I was speculating on the singularity of finding an eel in that country, and poking the creature with my stick, it climbed up a rock and escaped into a deep pool, hissing violently and showing a blunt and villainous head. Dr. Gray tells me it must have been a species of *Tropidonotus*, and that none of the freshwater snakes are poisonous. However, I never got bitten; and I generally took with me a small vial of sal-ammoniac as a remedy against such a contingency. I also met several times with the disgusting, but harmless, striped salamanders.

I here received intelligence of the death of my lamented and venerable friend, Monsieur de Charpentier, whose loss (although in the fulness of his years and honours) science has so sensibly felt. I had hoped to pass a few days with him before I returned to England.

From the Lago Maggiore I crossed the Alps by the St. Gothard Pass, and returned home through Lucerne, Basle, Strasbourg, and Paris. Londinum "longæ finis chartæque viæquet."

I will now proceed with the more scientific part of my memoir.

The extent of the geographical distribution of marine animals, as well as the laws which regulate that distribution, seem to be at present involved in such obscurity, that, although I may not be able to throw much light on the subject, any additional facts which I can adduce will, I am confident, be useful in assisting others in time to solve this difficult and interesting problem.

In considering this subject it is necessary, in the first place, to say a few words as to the definition and limits of what naturalists call "species."

The question whether a species exists in the scale of nature, or not, has been much discussed. Most naturalists maintain the affirmative. In the earlier stage of natural history it seems indeed almost absurd or supererogatory to doubt the existence of species; the number of objects presented for examination and comparison being few, and easily distinguishable by certain definite characters. As science however advances, the number of

objects increases, and greater difficulty consequently arises in separating and distinguishing them from each other; the line of demarcation becomes more and more faint, and the naturalist is tempted, not only to distrust the distinctiveness of certain characters which he had before regarded as sheet-anchors, but even to doubt the possibility of establishing any characters at all. This phase is ultimately succeeded by more or less critical views, dependent on the idiosyncrasy of the naturalist, as the sphere of his observation is extended; and he is then, by a sort of innate facility, able to discriminate species from varieties, and to assign to each its proper and relative position. He finds that the characters of distinctiveness vary in the different groups or genera and species; that differences of a more or less important nature, such as form, size, colour, and appendages, arise from locality, food, and other causes, and only constitute varieties; and that there is an inherent tendency of all species to adapt themselves to certain changes of condition, and to undergo transformations of frequently the most Protean kind. The discrimination of species and varieties is one of the most important duties of the naturalist, because, without it, the study of nature would lead to no result, and there would be no precise data from which any conclusions could be safely drawn. The facility or habit of such discrimination depends on both synthesis and analysis, and is only attainable by practice and a large sphere of observation. Hence, local naturalists do not in general possess this quality; the usual form of their error being to split species, and attach too much importance to minute differences. The necessity of rigorous discrimination of species and varieties cannot, indeed, be too much or too frequently insisted on. Messrs. Hooker and Thompson, in the introductory essay to their recent and valuable work entitled '*Flora Indica*,' which abounds in philosophical views and remarks as to species and varieties of plants, say with justice that "the discovery of a form uniting two others previously thought distinct, is much more important than that of a totally new species, inasmuch as the correction of an error is a greater boon to science than a step in advance."

It is unquestionable that the soft and hard parts of the Mollusca are of relative and nearly equal value; the former for generic, and the latter for specific distinction. Both must be studied in relation to each other; and it seems to me most illiberal in the malacologist or conchologist to ignore or depreciate the labours of his brother-naturalist. Philippi, in the second volume of his '*Fauna Molluscorum utriusque Siciliae*,' after stating that Bivona had seen the animals of several species of *Rissoa*, and that he had himself figured the animals of other species, concludes with this remark, "Hæ species omnes *simil-*

limis animalibus incoluntur." The same remark will apply to the "animals" or soft parts of the genus *Helix* and many others. Yet the "shells" or hard parts of the Mollusca are as readily distinguishable from each other, and form as good criteria of specific distinction, as the shell of a tortoise, a crab, or an insect, without reference to the other parts of the animal. Were it not for this test, fossil shells could no longer be regarded by the geologist as "medals of creation," and the important deductions which have been founded on them would be nugatory and valueless.

With respect to the separation and discrimination of "varieties," by which term naturalists understand a modification of the size, colour, and appendages of species, and sometimes even of their form, I have generally observed that when a difference of form exists between individuals evidently belonging to the same genus, in the same locality, and having the same food and other conditions of habitability, it is probable that such individuals belong to different *species*; but that when such difference exists between individuals belonging to the same genus, which inhabit distinct and separate localities, they ought to be regarded only as *varieties*. This is by no means however a certain rule, and it depends on the habits of the animal, the relative value of characters which distinguish each genus, and many other circumstances.

Now, putting aside the doubts which may be entertained by naturalists as to the distinction of certain species, we have positive data for ascertaining to some extent the distribution of British and Mediterranean Testacea, in the work of Philippi on the Mollusca of Naples and Sicily, and that of Forbes and Hanley on the Mollusca of Great Britain and Ireland. The descriptions and figures in each of these works are most accurate; and, whether all or many of the objects which have been so described and figured are true species or merely varieties, the same result is obtained, namely a comparison of the Testacea in each of these districts.

My first impression on examining the Testacea of the Gulf of Genoa was, that the fauna of the Mediterranean was mixed, and not peculiar to that sea. I found in it a large proportion of species which were familiar to me as British, and others having a more southern and even tropical habitat. This led me to inquire whether the division into certain definite areas, which the late Professor Forbes distinguished by the names of Boreal, Celtic, Lusitanian, and Mediterranean, was well founded; and the conclusion I have arrived at is, that such a division is arbitrary and irreconcilable with facts.

In Professor Forbes's Report (in 1850) to the British Asso-

ciation for the Advancement of Science, on British Marine Zoology, as well as in his introduction to the 'British Mollusca,' he has enumerated certain species which he called "peculiarly Northern" or "Boreal;" others which, according to his account, show the more powerful influence of the Scandinavian element in our fauna, and which he assigned to a "Celtic" type; some which he designated as "peculiarly British," and again others that he found to occur in our seas only in a few isolated patches which he regarded as "Glacial" outliers. Now, of the first-mentioned or "Boreal" species, I found several in the Mediterranean (viz. *Chiton Hanleyi*, *Mangelia brachystoma*, and *Næra costellata*), another (*Mangelia Leufroyi* or *Boothii*) has been described and figured by Philippi as a recent Sicilian species, and a fifth (*Scissurella crispata*) I believe to be identical with the *Scissurella decussata* of D'Orbigny. Of the second division or "Celtic" species, I met with *Tapes pullastra* (of which the *Venus geographicalis* of continental authors is a variety), *Acmæa virginea*, *Lucina borealis* or *radula*, and *Lucina flexuosa*; and Philippi has given *Trochus millegranus* and *Eulimella Macandrei* (his *Melania Scillæ*) as Sicilian species. Of the third division, or "peculiarly British" species, several (as *Jeffreysia diaphana*, and the so-called *Skeneæ*, besides *Argiope cistellula* of Searles Wood, which I think cannot be distinguished from the *Orthis Neapolitana* of Scacchi) also occurred to me in the Mediterranean; and of the last division or "Glacial" species I detected three species (namely *Nucula decussata*, *Næra cuspidata*, and *Cardium Suecicum* or *minimum*), and Philippi has given another (*Arca raridentata* or *Pectunculooides*) as Sicilian. I have moreover good reason to believe, judging from the very small extent of ground which has been as yet examined, that these exceptional species may be considerably added to when the wide extent of the Mediterranean Sea and its coasts has been more explored. I have myself been enabled to add to the Mediterranean fauna, in the short space of time which I devoted to this research, more than thirty species which had been hitherto considered as restricted to the British seas. It is obvious that negative evidence of the occurrence of any species (and especially of those which inhabit deep water) in any given area of sea is inadmissible; and naturalists do not differ from logicians or lawyers in rejecting such evidence.

It may indeed be argued in favour of the division into special or limited areas, that the species I have named, have, in the course of time, migrated or been diffused from the birthplace of their primæval ancestors, or from what is now called the centre or focus of their creation, and that this migration or diffusion has been facilitated by causes now in operation, and especially

by oceanic currents. But it must be borne in mind that the great Gulf-stream, which is the only current that could be effectual for such a purpose, sets from south to north, and that the indraught current from the Atlantic into the Mediterranean, through the Straits of Gibraltar, sets from west to east. Major Rennell was indeed of opinion (according to Admiral Smyth, whose excellent and elaborate work on the Mediterranean I have had frequent occasion to consult), that there is a general tendency of the Atlantic waters between 30° and 45° of north latitude, and from 100 to 130 leagues off the land, to move towards the Strait of Gibraltar, at a rate of not less than from fourteen to seventeen miles in twenty-four hours; although this opinion, the Admiral says, ought to be received *cum grano salis*, especially if depth be admitted as a condition of these 400,000 square miles. However, granting that this may to some (I am not prepared to say to what, or any) extent account for the migration or diffusion of species *from* the Lusitanian coast to the British or Mediterranean seas, it cannot be considered to operate in the opposite direction; and I therefore do not see how any species which we may for the present call, with Prof. Forbes, "peculiarly Northern" or "Boreal" (such as *Chiton Hanleyi*), or "Celtic" (as *Lucina flexuosa*), or "peculiarly British" (as *Jeffreysia diaphana*), or "Glacial" (as *Cardium Suecicum*), can find their way into the Mediterranean, while the Gulf-stream continues its present course. We will even assume that there is a counter-current (although our present hydrographical knowledge does not warrant the assumption) *from* the north to the south,—I would ask, how is it possible that species, which, like *Chiton Hanleyi*, inhabit the coralline zone, can be transported across the Atlantic to such a distance? The stationary habits of the adult animal, which passes its life adhering to stones and shells, forbid the idea of its voluntary migration. In its embryo state this *Chiton* is doubtless (as Mr. Clark has shown in the 'Annals' for December 1855 with respect to its congener, *Chiton cinereus*), like many other Mollusca, free, and capable of swimming about with considerable activity; but this stage of growth only lasts three or four days, when the metamorphosis or final development takes place, and the creature, having "sown its wild oats," settles down for the rest of its life, and only crawls about for a short distance in search of food. The same remark occurs to me with respect to the littoral species, such as *Skenea planorbis* (a well-known inhabitant of Great Britain, and now for the first time noticed by me as Mediterranean), which would appear to be physically incapable of crossing the stream of the English Channel in order to diffuse itself along the western coasts of Europe and gain ingress into

the Mediterranean. How can this, or any other *littoral* species, many of which are common to the British and Mediterranean seas, find its way from one to the other? Voluntary locomotion, it is tolerably clear to all who know the proverbial slowness of pace at which a snail, whether land or marine, can travel, would require an immense time to complete the journey, even if the animal knew or could find its way. Bivalves, being destitute of a head or eyes, would of course labour under a greater disadvantage; and besides, their motion is never progressive, but is effected by eccentric and irregular leaps. The only other modes, therefore, in which this great change of position could be accounted for, are, either that the shell-fish may be torn from their submarine abodes, and carried perforce by the current, or that they may be in their embryonic state wafted to the place of destination. The former mode would require it to be taken for granted that there exist no rocks or other obstacles in the course of their passage, that the current reaches the sea-bottom (which is more than doubtful), and that the shell-fish in question live within the range of the current. The other supposition can only apply to the Bivalves, Brachiopods and Chitons, whose embryo or fry are free and tolerably active swimmers, undergoing during that period of their existence a singular metamorphosis, as I have myself witnessed in the case of the common oyster. But as the fry are developed and attain their normal state within a few days at the furthest after being excluded from their parent, and then become fixtures for life, or nearly so in the case of the Chitons, it is hardly possible that the time allotted to the first stage of their existence would enable them to traverse such a vast distance. If we reject Forbes's proposition that the species I have before mentioned are Boreal, Celtic, British, or Glacial, and consider them as Mediterranean, the same difficulty arises; and we shall not find the mode of transit from the Mediterranean to the British seas more easy or probable when we reflect that the only ingress into or egress out of the Mediterranean is through the Straits of Gibraltar, and especially if the only current which flows through that passage is an indraught, and sets *from*, instead of *to*, the Atlantic. The popular idea of a counter- or under-current *from* the Mediterranean outwards is (to say the least) not proved; and I do not think Lieutenant Maury, in his recent and excellent treatise on the physical geography of the sea, has made out a strong case in its support, in opposition to the opinions of Admiral Smyth and Sir Charles Lyell. If there is such an outer- or under-current from the Mediterranean into the Atlantic, shell-fish might, it is true, be transported from the former to the latter; but they would in that case be, metaphorically as well as literally, "at

sea," because, according to Maury's charts and account of the Gulf-stream, the course northward of that great current lies far beyond the range of the Mediterranean outlet into the Atlantic. If there is no such outer current, shell-fish leaving the British shores would, after crossing the English or Irish Channel, have to traverse, by a circuitous route, the western coasts of Europe by means of the great Arctic current, which is supposed to pass under the Gulf-stream, before they could reach and enter the Strait of Gibraltar. Either of these suppositions therefore, except perhaps with respect to pelagic or floating shell-fish (such as the Pteropods and *Ianthina communis*), does not appear to me well founded, and still less probable in the case of shell-fish which permanently adhere to rocks, or their fry, for the reasons I have before given. I therefore cannot help thinking that the migration or diffusion, beyond a limited range, of marine shell-fish by means of oceanic currents now in operation is physically improbable, and that it is unnecessary thus to account for the present distribution of these animals.

For the same reasons, I am not disposed to admit the theory which has been propounded and maintained by so many naturalists, that certain areas now exist, containing species peculiar to each, and having each its own separate nucleus or centre from which these species have radiated.

In the last edition of Lyell's 'Principles of Geology' is a map showing the extent of land in Europe which can be proved to have been covered by the sea during the earlier part of the tertiary, or the eocene, period; and a wide opening from the Bay of Biscay to the Gulf of Lyons, in the upper part of the Mediterranean, appears to have formerly connected that sea with the North Atlantic. It has been also proved by Brocchi, Philippi, and Searles Wood, that a large proportion of shells now living in the Mediterranean are identical with fossil species from the tertiary strata, both in Italy and Great Britain, and *vice versa*; and it is not too much to assume, that in former æras marine currents existed by which animals might have been transported from one to the other of those districts, or rather that they were then diffused throughout a larger area than at present. Whether the original birthplace or nucleus of these shell-fish was in that part of the ocean which is now called the North Atlantic, or in the Mediterranean, is immaterial;—all I contend is, that the areas of geographical distribution, as proposed by the late Professor Forbes and others, are too much restricted to existing circumstances, and that they ought rather to be referred to a prior state of things. As yet, we want infinitely more information and data as regards the distribution of recent and fossil shells, as well as a more accurate discrimination of species

and varieties, and a knowledge of the conditions which influence the transition of one to the other, before any satisfactory theory can be established. Whether the term "species" used by naturalists to denote distinct assemblages of animals and plants which have certain characters in common, has indeed any foundation in nature, is another question; but it is extremely difficult, if not impossible, to say, with any degree of certainty, what modification of form (to an extent which we should now consider amounts to specific distinction) may have taken place in any race of animals, and particularly in the Invertebrata, during the lapse of so many thousands or myriads of years as have been assigned to the tertiary period. We know the great change which is continually occurring in the form of recent species caused by a difference of station or habitat, food, and many other conditions, and to which we give the name of "variety." How far then is it right to pronounce, without doubt or hesitation, that any of the tertiary species differ from living analogues; taking into account not only the gradual modification of form which I have before adverted to as probable, but also the absence of numerous links both in fossil and recent species? I am however satisfied that the proposed distribution of the European Mollusca into any definite provinces or regions is not warranted by a mature consideration of those geological and conchological data which we at present possess.

It is by no means certain that any definite provinces or regions originally had any existence. We know that some species of shell-fish are what is termed "cosmopolite," and are found in every part of the world at various depths of the sea. The most familiar instance that occurs to me is *Saxicava rugosa*, which, according to Sir Charles Lyell (*Principles of Geology*, p. 650), "is spread over all the North Polar seas, and ranges in one direction through Europe to Senegal, occurring on both sides of the Atlantic; while in another it finds its way into the North Pacific, and thence to the Indian Ocean. Nor do its migrations cease till it reaches the Australian seas." This species of shell-fish is found in the sublittoral and laminarian zones (between low-water mark and fifteen fathoms, or thereabouts), *but never in deep water*, on the coast, perforating submarine limestone rocks. Now, although the fry of the *Saxicava* is undoubtedly free during the short period of its first stage, before the shell is developed and its boring powers brought into action, and it can therefore be wafted some distance, I am not aware that any marine current or stream sets from one side of the Atlantic to the other, nor that there exists any intermediate station, fitted for the reception and habitat of the animal, where it could settle and propagate a succession of emigrants to con-

tinue the route. Even at the greatest rate assigned by Sir Charles Lyell to oceanic currents (three miles per hour), it would take thirty or forty days for the fry of a *Saxicava* to traverse the Atlantic; and it is not reasonable to suppose that the development of the animal would be postponed for such an extraordinary period, or its vitality suspended, for the purpose of its migration,—to say nothing of the innumerable obstacles that would occur in its passage, from cross currents, being snapped up by other animals for food, or a subsidence into some deeper part of the sea or abyss from which it could not extricate itself. It seems to me more probable that the species in question was at its first creation diffused over the whole of the ocean, and that the area of its habitability was afterwards limited by some accidental circumstance, such as a deposit of mud, which choked and exterminated the animal in the intermediate districts. Something like this I have noticed on the coast of South Wales, in the case of a once extensive colony of *Pholas dactylus* having become extinct within the memory of living man, in consequence of the bed of peat which they had inhabited having silted up and been covered with sand and mud by the action of the tides. Changes of climate, and many other conditions on which the habitability of such animals depends, may have contributed to confine the original area for other species within narrower limits; and it is therefore not necessary to resort to the theory of migration, or diffusion of species from one province to another, in order to account for their present distribution.

Mr. Searles Wood, in his account of a British Crag shell (*Pyrula reticulata*), which he considers to be identical with a species now inhabiting the Indian Ocean, is of opinion that certain shell-fish which formerly lived together, but are now found to inhabit different climates, have since retired or migrated into those parts of the world, the one north and the other south, where the temperature of both is very different from that which must have been favourable to their existence at the period anterior to the formation of the Coralline Crag, and that they have therefore in some degree changed their nature in assimilating such extremes to their present existence; and he assumes that their dispersion was effected by oceanic currents in opposite directions. He, in fact, attributes the changes which have taken place in geographical distribution, not to any alteration in the temperature, but to an alteration in the habits of the animals themselves, caused by gradual migration. But I cannot help recalling to my mind the apophthegm of the old poet, which appears applicable as well to the nature of inferior animals as to that of mankind: “*Cœlum, non animum, mutant qui trans mare currunt.*” I consider it to be far more likely

that a uniform temperature once prevailed, accompanied by a general diffusion of all animals over the whole world; and that owing to successive changes of temperature, induced by the formation or elevation of land in some parts and its submersion under the sea or depression in others, certain species became extinct, or survived, as the climates became colder or warmer in different parts of the globe. Many species (as *Dentalium dentalis*) occur in the tertiary strata of Great Britain, which, apparently, have ceased to live in our seas, although they still inhabit the Mediterranean; and others (as *Mya truncata*) are recorded by Philippi as occurring in the same formation in Sicily, which in like manner have apparently ceased to exist in the Mediterranean, although they still inhabit the British and North Atlantic seas. In each of these cases, the species are conspicuous and abundant in their respective localities. The upper and lower tertiary formations, both in Great Britain and Sicily, as well as in the Subapennine district, contain also many species which now inhabit only arctic or tropical climates; and they are found associated with other species which now live in the British and Mediterranean seas. Besides the vast extent of coast and ground in these seas, which has never yet been explored by naturalists, as well as of the tertiary strata in Italy and the North of Europe (where a few scratchings here and there, rather than a systematic examination of their contents, are all that appears to have been hitherto attempted), it must not be forgotten that the whole of the North Atlantic and Mediterranean seas, together with the area of dry land in which the tertiary formations in Europe have been traced, form after all but a small portion of our globe.

The above remarks must be understood to apply rather to the extent and mode of geographical distribution than to the existence of special faunas. I do not deny that certain species may, and probably do, occur only in limited areas. The question as to the distribution of land animals and plants seems to me to involve other considerations than those which refer to marine animals, namely the influence of climate and winds, as well as (in the case of plants) the dormant vitality of seeds.

Too much care cannot be taken in the formation of materials for extending our knowledge of geographical distribution. The most accurate discrimination of species and varieties is indispensable; as well as the collection of specimens *ab ovo*, and from as many localities as possible. The young of the acephalous Mollusks, or Bivalves, always exhibit, after undergoing their metamorphosis, the peculiar character of the species to which they belong; but in the Gasteropoda, or Univalves, the case is often different, owing to the first whorls of their shell being

(as in the Cowries) covered by the mantle of the animal, and the consequent deposition of shelly matter, so as to conceal the spire, the truncation or decollation of those whorls (as in *Cacum*), or the altered position of the branchial opening and subsequent loss of the spire, as in *Fissurella*.

The present distribution and existence of the same species of marine Testacea, in many and widely separated parts of the globe, may be in some measure accounted for by the equable temperature which is usually maintained in the sea, independent of climate, and by the want of solar influence beyond a limited depth; water being, as is well known, one of the worst conductors of heat. Admiral Smyth states that there is a sensible diminution between the surface-temperature and that obtained at great depths in the Mediterranean, and which he roundly estimates at 1° for every twenty fathoms in depth, except where the agency of submarine currents may be at work, but that below 180 fathoms to the greatest depths which he had explored, the temperature varied but little from 42° or 43° of the Fahrenheit scale; and he adds, that a comparison of his eight-fathom observations on the mean temperature of that sea, led him to consider that the Mediterranean waters average about $3^{\circ} 5'$ of Fahrenheit more heat than that of the western part of the Atlantic Ocean.

The greatest specific variation between the British Testacea and those of the Mediterranean occurs, as might have been expected from the difference of latitude and temperature, in the denizens of the littoral and laminarian zones; particularly in the genera *Mytilus*, *Chiton*, *Patella*, *Trochus*, *Buccinum*, *Fusus*, and *Murex*. In each of those zones certain species seem to be represented by their analogues; as *Mytilus edulis*, *Chiton cinereus*, *Patella vulgata*, *Trochus lineatus*, *Buccinum undatum* and *Fusus Islandicus* of our own coasts are respectively replaced in the Mediterranean by *Mytilus minimus*, *Chiton Siculus*, *Patella scutellaris*, *Trochus fragarioides*, *Murex trunculus* and *Fusus corneus*.

It is remarkable that examples of the same species from the Mediterranean are smaller than those found in the British seas. *Tellina balaustina*, *Jeffreysia diaphana* and *Rissoa pulcherrima* are instances of this.

A much greater range of variation is found to exist in land than in marine animals, owing to the more uniform temperature of the sea and its coasts. According to Mr. MacAndrew, each of the islands which form the groups of the Canaries, Madeiras, and Azores, possesses some species peculiar to itself; and every British conchologist is aware of the very limited habitat which some land and freshwater shells, as *Helix Pisana*, *Assiminia*

Grayana, *Linneus involutus*, and others, have in our own country, and how local and apparently capricious appears to be the distribution of many species.

The speculation as to the successive and recent creation of species appears to me very questionable, and more abstruse than that of geographical distribution; because we do not know the extent of modification to which species originally created have been subject, nor whether all existing species, or the remains of former species, have been either discovered or destroyed. Humboldt has characterized this subject as one of the mysteries which natural science cannot reach.

Although considerable pains have of late years been taken to reconcile the labours of British and Continental naturalists, much yet remains to be done. The former want of intercourse between naturalists of our own and other countries, arising from continual warfare, national jealousies, and the difficulties of travelling and communication, has unfortunately caused great confusion in the nomenclature of science; and no pains ought to be spared in removing it as much as possible, giving due credit to authors of every nation according to the priority of publication. To give some idea of the multiplicity of names which have been given by different authors to the same species of Testacea, I may mention that for our common cockle (the *Cardium edule* of Linnæus) and its varieties, no less than sixteen, and for our oyster fourteen different names have been assigned by British, French, Italian, and German conchologists; and for another shell (*Bullæa scabra* of Müller), six generic and seven specific names have been given by British, Danish, Norwegian, Italian, and American writers!

The opportunities which have thus occurred to me of a careful examination and comparison of an extensive series of Mediterranean species, and especially those of the more difficult genera (such as *Rissoa* and *Odostomia*), have led me to form what I believe to be more just conclusions with respect to the same species in Great Britain; and the result will be shown in the subjoined list. That list contains all the species which I found on the Piedmontese coast, as well as some which I observed in M. Verany's collection from Nice and Genoa. I have added a few remarks as to some of these, and the descriptions of ten new species. The names of recorded species are those of Philippi and the authors of the 'British Mollusca,' except in a very few cases where it appeared to me necessary to adopt or notice those given by earlier discoverers. Those species which were not found by myself, but were communicated by M. Verany, or noticed by me in his collection, are distinguished by italics. I had no means at the time of making out the synonymy

for the latter species, and I therefore give the names chiefly on his authority. I have adopted the arrangement of the 'British Mollusca,' as preferable to that of Philippi, who used Lamarek's system. The accompanying plate contains figures, from Mr. James de Carle Sowerby's well-known and accurate pencil, of my new species, and of *Bulla ovulata*, which was indifferently figured by Brocchi. I have not thought it necessary to particularize the localities, except in a few instances of rare or peculiar species.

Any attempt to tabulate, with precision, the per-centage or proportion of Mediterranean species, in comparison with those of Great Britain, would be unsatisfactory, as it must necessarily fluctuate with the continual discovery of new species. The general (although confessedly imperfect) result at which I have arrived from my own investigation and reference to other lists is, that out of about 500 species of British marine Testacea, one half are identical with those of the Mediterranean, and that we possess consequently about 250 species which have not yet been described or indicated as Mediterranean. The species of Mediterranean Testacea probably number 850, out of which about 600 have not yet been described or noticed as British.

The works which I have consulted in the preparation of this memoir, and especially with regard to the question of geographical distribution, are,—Brocchi's 'Conchiologia Fossile Subapennina,' Philippi's 'Fauna Molluscorum utriusque Siciliae,' Forbes and Hanley's 'British Mollusca,' Smith's 'Mediterranean,' Searles Wood's 'Crag Mollusca' in the Palæontographical Society's publications, Lyell's 'Principles of Geology' (ninth edition), Maury's 'Physical Geography of the Sea,' Hooker and Thompson's 'Flora Indica,' Risso's 'Fauna of Southern Europe,' Payraudeau's 'Mollusca of Corsica,' D'Orbigny's Contribution to Barker-Webb and Berthelot's 'Natural History of the Canaries,' Professor Edward Forbes's Reports to the British Association, and Mr. MacAndrew's Pamphlet on the Geographical Distribution of the Testaceous Mollusca in the North Atlantic and neighbouring seas (1854), besides many other scattered contributions to natural history.

Acephala Lamellibranchiata, or Bivalves.

Septaria Mediterranea, Lam. Nice.

Teredina personata, Lam. Nice!

Teredo navalis, in ships' bottoms. Nice.

Saxicava Arctica, *Phil. & Brit. Moll.*

Venerupis Irus, *Ph. & B. M.*

Corbula nucleus, *Ph. & B. M.*—*C. rosea* (Brown, 1827), *B. M.* (*C. Mediterranea*, Costa, 1829, *Ph.*). Besides the localities indicated
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on my authority in the 'British Mollusca,' I have taken this species on the west coast of Scotland in an immature state; and the Mediterranean specimens confirm my idea of its distinctness, and identity with Costa's species

Sphænia Binghami, *B. M.*

Næera costellata, *B. M.* (non *Corbula costellata*, *Ph.*).—*N. cuspidata*, *B. M.* (*Corbula cuspidata*, *Ph.*).

Pandora obtusa, *Ph. & B. M.*

Thracia phaseolina, *Ph. & B. M.*

Solen siliqua, *Ph. & B. M.*

Solenomya Mediterranea, *Ph.*

Solecurtus strigilatus, *Ph.*—*S. candidus*, *Ph. & B. M.*—*S. coarctatus*, *B. M.* (*Solen coarctatus*, *Ph.*).

Diodonta fragilis, *B. M.* (*Tellina fragilis*, *Ph.*, *Petricola ochroleuca*, *Lam.*).

Tellina balaustina, *Ph. & B. M.*—*T. pulchella*, *Ph.*—*T. donacina* and varieties, *Ph. & B. M.*—*T. serrata*, *Ph.*—*T. incarnata*, *B. M.* (*T. planata*, *Ph.*).—*T. Costæ*, *Ph.*—*T. fabula*, *Ph. & B. M.*—*T. tenuis*, *Ph. & B. M.*

Syndosmya alba, *B. M.* (*Erycina Renieri*, *Ph.*); var. (*Er. similis*, *Ph.*).—*S. prismatica*, *B. M.* (*Er. angulosa*, *Ph.*).

Scrobicularia piperata, *Ph. & B. M.*—*S. Cottardi*, *Ph.*

Donax anatinus, *B. M.* (*D. semistriatus*, *Ph.*).—*D. trunculus*, *Ph. & B. M.*

Mesodesma Donacilla, *Ph.*

Mactra inflata, *Ph.*—*M. stultorum* and var. *cinerea*, *Ph. & B. M.*—*M. subtruncata*, *B. M.* (*M. triangula*, *Ph.*).

Tapes aurea, *B. M.* (*Venus aurea*, *Ph.*).—*T. læta* (*Venus læta*, *Ph.*) and variety.—*T. decussata*, *B. M.* (*V. decussata*, *Ph.*).—*T. pullastra*, *B. M.*, and var. (*Venus geographica*, *Ph.*).—*T. virginea*, *B. M.* (*V. Beudanti*, *Ph.*).

Cytherea Chione, *Ph. & B. M.*—*C. Venetiana*, *Ph.*

Venus casina, *Ph. & B. M.*—*V. ovata*, *B. M.* (*V. radiata*, *Ph.*).—*V. striatula*, *B. M.*; and variety (*V. gallina*, *Ph.*).—*V. verrucosa*, *Ph. & B. M.*

Artemis exoleta, *B. M.* (*Cyth. exoleta*, *Ph.*).—*A. lincta*, *B. M.* (*C. lincta*, *Ph.*).

Lucinopsis undata, *B. M.* (*Venus undata*, *Ph.*).

Circe minima, *B. M.* (*Cyth. apicalis*, *Ph.*).

Astarte triangularis, *B. M.* (*A. lævigata*, *Ph.*).

Isocardia Cor, *Ph. & B. M.*

Cardium aculeatum, *Ph. & B. M.*; young (*C. ciliare*, *Ph.*).—*C. echinatum*, *Ph. & B. M.*; young (*C. Deshayesii*, *Ph.*).—*C. erinaceum*, *Ph.*—*C. tuberculatum*, *Ph.*—*C. edule*, *B. M.*, var. (*C. rusticum*, *Ph.*).—*C. pygmæum*, *B. M.* (*C. exiguum*, *Ph.*). Although there can be no doubt of the identity of these two species, it is rather singular that Philippi does not notice the interstitial punctures, but merely says, "interstitia leviter transversim striata."—*C. minimum*, *Ph.* (*C. Suecicum*, *B. M.*). Philippi's name has the decided priority and is more appropriate than the local name of Lovèn.—*C. papil-*

losum, (*Poli*) *Ph.* (*C. nodosum*, (*Turton*) *B. M.*). *Poli*'s name has much the priority of *Turton*'s. The Mediterranean specimens are coloured, but appear to differ in no other respect from our own.—*C. punctatum*; (and variety (*C. scabrum*), *Ph.*).—*C. fasciatum*, *B. M.* (*C. parvum*, *Ph.*).—*C. Norvegicum*, *B. M.* (*C. sulcatum*, *Ph.*).

Cardita sulcata, *Ph.*—*C. aculeata*, *Ph.*—*C. trapezia*, *Ph.*—*C. calyculata*, *Ph.*

Lucina Pecten, *Ph.*—*L. radula*, *Ph.* (*L. Borealis*, *B. M.*).—*L. flexuosa*, *B. M.* (*Ptychina biplicata*, *Ph.*).—*L. leucoma*, *B. M.* (*L. lactea*, *Ph.*).—*L. spinifera*, *Ph. & B. M.*

Montacuta bidentata, *B. M.*

Turtonia minuta, *B. M.*

Kellia suborbicularis, *B. M.* (*Bornia inflata*, *Ph.*).—*K. nitida*, *B. M.*—*K. rubra*, *B. M.* (*B. seminulum*, *Ph.*).

Galeomma Turtoni, *Ph. & B. M.*

Chama Gryphoides, *Ph.*

Mytilus Gallo-provincialis, *Ph.* Nice: on ships' bottoms only.—*M. minimus*, *Ph.*

Modiola barbata, *Ph. & B. M.*—*M. tulipa*, *Ph. & B. M.*—*M. lithophaga*, *Ph.* (*Lithodomus lithophagus*, *Lam.*).

Crenella marmorata, *B. M.* (*Mod. discrepans*, *Ph.*).—*C. discors*, *B. M.*—*C. costulata*, *B. M.* (*Mod. costulata*, *Ph.*).

Nucula nucleus, *B. M.* (*N. margaritacea*, *Ph.*).—*N. nitida*, *B. M.*—*N. radiata*, *B. M.* Nice.—*N. decussata*, *B. M.* (*N. Polii et sulcata*, *Ph.*).

Leda (*Nucula*) *emarginata*, *Ph.*—*L.* (*Nucula*) *minuta*, *Ph.*

Pectunculus pilosus, *Ph. & B. M.*, and varieties.—*P. violascens*, *Ph.*

Arca Noæ, *Ph.*—*A. tetragona*, *B. M.* (*A. navicularis*, *Ph.*).—*A. barbata*, *Ph. & B. M.*—*A. diluvii*, *Ph.*—*A. lactea*, *Ph. & B. M.*

Avicula Tarentina, *Ph. & B. M.*

Pinna pectinata, *Ph. & B. M.*, and variety (*P. ingens*, *auct.*).—*P. muricata*, *Ph.*

Lima inflata, *Ph.*—*L. squamosa*, *Ph.*

Pecten varius, *Ph. & B. M.*—*P. pusio*, *Ph. & B. M.*—*P. Testæ*, *Ph.*—*P. polymorphus*, *Ph.*—*P. Danicus*, *B. M.* (*P. adspersus*, *Ph.*).—*P. hyalinus*, *Ph.*, and variety.—*P. maximus*, *Ph. & B. M.*—*P. Jacobæus*, *Ph.*—*P. opercularis*, *Ph. & B. M.*—*P. sulcatus*, *Ph.*

Spondylus Gæderopus, *Ph.*

Ostrea plicatula, *Ph.*—*O. cristata*, *Ph.* Whether this is a variety of *O. edulis*, it is rather difficult to say, as the latter species is subject to great variation. I certainly never met with the common form of our oyster (whether "native," "Welsh," or "rock") in the Mediterranean, nor is it mentioned by *Philippi* or *Payraudeau* as a recent species. The kinds now found in that sea are solitary, and not gregarious. It is well known that the Romans got their principal supply from Britain, although the *Circean* oyster ranked as a delicacy with sea-eggs from *Misenum* and with broad scallops, the boast of luxurious *Tarentum*.

Anomia Ehippium, *Ph. & B. M.*, and varieties (*A. polymorpha*

and margaritacea, *Ph.*).—A. *Patelliformis*, *B. M.* (*A. scabrella* and *elegans*, *Ph.*).

Acephala Palliobranchiata, or Brachiopods.

Terebratula caput-serpentis. Villa Franca.

Argiope (*Orthis*) *truncata*, *Ph.*.—A. (*Orthis*) *Neapolitana*, *Scacchi* (*Orthis seminulum*, *Ph.*, *Megathyris cistellula*, *Searles Wood*). A careful comparison of Mediterranean specimens with those from Zetland of this variable species, confirms my former opinion of its identity with the *Argiope* (*Megathyris*) *cistellula* of the 'British Mollusca.' It would be desirable if *Philippi's* name of *seminulum* could be retained, instead of the prior but less appropriate name given by *Scacchi*.

Pteropoda.

Hyalæa vaginella, *Ph.*

Spirialis Australis, *Eydoux & Souleyet*.—*S. Trochiformis*, *Eyd. & Soul.* (*S. Flemingii*, *B. M.*).—*S. rostralis*, *Eyd. & Soul.* (*S. Macandrei*, *B. M.*).—*S. Jeffreysii*, *B. M.* *Spezia*, where only a single specimen, however, occurred to me.

Heteropoda.

Carinaria Mediterranea. *Nice*.

Gasteropoda Prosobranchiata.

Chiton fascicularis, *Ph. & B. M.*.—*C. Siculus*, *Ph.*.—*C. Cajetanus*, *Ph.*.—*C. variegatus*, *Ph.*.—*C. Hanleyi*, *B. M.*.—*C. Polii*, *Ph.*

Patella scutellaris, *Ph.*.—*P. fragilis*, *Ph.*.—*P. Tarentina*, *Ph.* (*P. athletica*, *B. M.*).—*P. Lusitanica*, *Ph.* I did not meet with any of the usual forms of *P. vulgata*; and *Philippi* only mentions it doubtfully as fossil. It is however a very variable species, and may be identical with *P. cærulea* of *Lamarck* (not of *Linnaeus*), or some other of the allied species which are described by *Philippi*.

Acmaea virginea, *B. M.* (*Patella Gussonii*, *Ph.*).

Dentalium dentalis, *Ph.*; and var. *semicostata*.—*D. novemcostatum*, *Payr.* (*D. dentalis*, var. β , *Ph.*). Specimens of the last, which I took at *Spezia*, have ten ribs and no intermediate smaller ones, but numerous fine longitudinal striæ. The extremity or apex in my largest specimen is truncated, but apparently not by an accidental fracture. Colour the same as in *D. dentalis*, but the size is larger.

Pileopsis Hungaricus, *B. M.* (*P. ungarica*, *Ph.*).

Gadinia Garnoti, *Ph.*

Calyptræa Sinensis, *B. M.* (*C. vulgaris*, *Ph.*); var. *gibba*; and var. *fulva*.

Crepidula unguiformis, *Ph.*

Fissurella Græca, *Ph.* Not the *F. Græca* of most British authors, which is *F. reticulata* of *B. M.*.—*F. costaria*, *Ph.*.—*F. gibba*, *Ph.*

Emarginula elongata, *Ph.*.—*E. cancellata*, *Ph.*

Scissurella. I cannot help thinking the position assigned to this genus by its founder, D'Orbigny, is correct, and not between Adeorbis and Ianthina as proposed by the authors of the 'British Mollusca.' *S. elegans*, *D'Orb.* (*S. striatula*, *Ph.*) and var. This species is very variable in form and sculpture, the longitudinal ribs being more or less distinct and partial, and the apex more or less flattened or convex; but the fine transverse striæ are always observable under a lens magnifying four or five diameters. It has *not* an operculum; but I unfortunately had no microscope with me to examine the animal. I found it plentifully alive in sea-weed at Spezia and Lerici.

Scissurella cancellata, n. s. Pl. II. f. 1.

Testa orbiculato-depressa, alba, nitidiuscula; anfractibus 3, rotundis, ultimo costis curvis circa 20 elevatis longitudinalibus, carina fissurali interruptis, costellisque totidem transversis decussato; vertice planato, carina lata acuta subincrassata canaliculata circumdato, costis radiatim cincto; canali transversim et arcuatim striato; apertura suborbiculari; umbilico angusto; latitudine $\frac{1}{20}$, longitudine $\frac{1}{30}$ uncia.

Although I only found a single specimen (at Sestri di Levante), it is so different from any of the species hitherto described, that I cannot help noticing it. Philippi has described and figured three species; but the only one this approaches in form (his *S. plicata*, which is the *S. costata* of D'Orbigny) he says has no transverse striæ, "*striis transversis nullis.*" It agrees with *S. Bertheloti* of D'Orbigny (Webb and Berthelot) in the sharp keel which projects considerably beyond the last whorl; but the ribs in that species are much more numerous, and it also wants the transverse striæ. It differs from *S. striatula* of Philippi in the stronger, fewer and more distant ribs, both longitudinal and transverse, as well as in the flattened spire and strong keel. This is also twice the size of either of Philippi's species.

Haliotis lamellosa, *Lam.* *Palmaria* I.—*H. tuberculata*, *Ph.* & *B. M.*
Trochus granulatus, *Ph.* & *B. M.*—*T. zizyphinus*, *B. M.*—*T. conulus*, *Ph.* & *B. M.*; and var. β . *dilatata* of Philippi, who refers it to *T. zizyphinus*. This last resembles closely the smooth variety of our species; and the difference of colour (on which the authors of the 'British Mollusca' lay stress), as well as the smaller size of the Mediterranean specimens, scarcely, I think, warrant a specific distinction; var. (*T. violaceus*, *Risso*).—*T. dubius*, *Ph.* (*T. conulus*, var. ?).—*T. exiguus*, *B. M.* (*T. crenulatus*, *Ph.*); and var. *T. striatus*, *Ph.* & *B. M.*—*T. fragarioides*, *Ph.*—*T. articulatus*, *Ph.* (*T. fragarioides*, var. ?).—*T. Laugieri*, *Ph.*—*T. divaricatus*, *Ph.*; var. *lævis*; and var. *minor*.—*T. sanguineus*, *Ph.*—*T. Adansonii*, *Ph.*—*T. magus*, *Ph.* & *B. M.*—*T. canaliculatus*, *Ph.* Nice—*T. varius*, *Ph.*—*T. Richardi*, *Ph.*—*T. umbilicaris*, *Ph.*—*T. leucophæus*, *Ph.*; var.; and monstr.—*T. tumidus*, *B. M.* (*T. Racketti*, *Ph.*).

Trochus zonatus, n. s. Pl. II. f. 2, 3.

Testa orbicularis, compresso-conoidea, tenuis, viridescenti-alba, zonis nigris strigisque obliquis rubris ad suturam anfractuum maculatis pulchre notata; anfractibus 4, convexiusculis, nitidis, sulcis spiralis latis (in ultimo anfractu utrinque 6, in penultimo 3) excavatis et interstitiis confertim concentricis striolatis; sutura distincta; apertura rotundo-rhomboides, ad marginem anteriorem vix angulata; umbilico profundo, aperto; long. $\frac{1}{20}$, lat. $\frac{1}{30}$ unciae.

Sestri di Levante and Spezia, at the roots of sea-weed in the littoral zone; not common.

Although this pretty little shell has relations with *Trochus umbilicaris* in its young state, it may be readily distinguished by the greater convexity of the whorls and the almost total want of any angularity or keel on the last volution. The young of this species closely resembles a *Skenea*, and it appears to form a passage to this genus.

Monodonta corallina, Ph.—*M. Vieilloti*, Ph.—*M. glomus*, Ph.—*M. Jussieui*, Ph.

Turbo rugosus, Ph.

Phasianella pullus, Ph. & B. M.—*P. intermedia*, Ph. I found the last species in greater plenty than *P. pullus*, but in the same locality. The spire is longer and the suture deeper, and the markings are very peculiar and unmistakable, as Philippi also remarked. The fry resembles a *Lacuna* in form, and has the last whorl and umbilical rea spirally striated.—*P. speciosa*, Ph.; and var.

Adeorbis subcarinata, B. M. (*Natica? subcarinata*, Ph.). Nice.

Ianthina communis, B. M. (*I. bicolor*, Ph.).—*I. pallida*, B. M. (*I. patula*, Ph.).

Littorina Neritoides, B. M. (*Turbo Neritoides*, Ph.).

Rissoa lactea, Ph. & B. M.—*R. labiata*, Ph., allied to, if not identical with, *R. striatula*, B. M.—*R. crenulata*, Ph. & B. M.; and var. minor.—*R. cimex*, Linn. (*R. calathiscus*, Ph.); and var. alba.—*R. calathus*, B. M. (*R. cimex*, Ph.).—*R. Montagui*, Ph.; var. *lineolata*; and var. minor.—*R. scabra*, Ph. An analogue of *R. punctura*, B. M., which it somewhat resembles. In fresh specimens the spiral cingula are of a fulvous colour, as in *R. Montagui*, var. *lineolata*.—*R. Beanii*, B. M. It seems surprising that this common and widely diffused species should not have been known to Philippi, although I suspect his *R. textilis* is the younger state of it before the outer lip and rib are formed.

Rissoa Philippiana, n. s. Pl. II. f. 4, 5.

Testa clavata, turrata, fusca, solidula; anfractibus 6 planatis, in medio subcarinatis, costellis longitudinalibus (in ultimo anfractu 12) cingulisque transversis (in ultimo anfractu 5) instructis, cingulis duobus superioribus tuberculos efformantibus; sutura profunda; apertura subrotunda, marginata, subeffusa, tertiam spirae partem æquante; umbilico nullo; long. $\frac{1}{12}$, lat. $\frac{1}{20}$ unciae.

This may possibly be the variety of *R. dictyophora*, which Philippi

referred to in these words, "variat cingulis transversis in carinas acutas elevatis;" but it does not correspond with his description and figure of the typical species. In the last and penultimate whorls there are two rows, and in the preceding whorl one row of tubercles.

Foci, near Genoa, on sea-weed in the littoral zone; not common. Nice, Verany.

Rissoa costata, *B. M.* (*R. exigua*, *Ph.*).

Rissoa contorta, n. s. Pl. II. f. 6, 7.

Testa brevi-cylindrica, ad apicem obtusa, lutea aut alba, solidula; anfractibus 4, ventricosis, sensim crescentibus, lævibus, nitidis, zonis duabus fulvis cinctis; sutura profunda; apertura subrotunda, subeffusa, tertiam spiræ partem superante, margine connexo, soluto; umbilico angusto; long. $\frac{1}{20}$, lat. $\frac{1}{30}$ unciaë.

Genoa, Foci, Sestri di Levante and Spezia, on sea-weed in the littoral zone; common. Nice, Verany.

This elegant species appears to be the representative of our *Rissoa striata*; but it has a different habitat, the latter being found under stones and at the roots of *Corallina officinalis* in the sublittoral zone.

Rissoa glabrata, *Ph.*; and var. *alba*; (*R. punctulum*, *Ph.*, Moll. Sic. vol. i. p. 154). Not the species referred to with doubt by the authors of the 'British Mollusca' under the name of *Odostomia glabrata*, but allied to *R. vitrea*, from which it differs in the greater solidity of the shell, its more obtuse whorls, and more contracted aperture which is strengthened by an outer rib. It varies considerably in size. I found it in abundance on all the coast, and noticed it in M. Verany's collection from Nice.—*R. vitrea*, *B. M.*—*R. proxima*, *B. M.*—*R. inconspicua*, *B. M.* (*R. rudis*, *Ph.*); var. *a. albula*, *B. M.* (*R. nana*, *Ph.*); var. *c*, *B. M.* (*R. radiata*, *Ph.*); var. *d*, *B. M.*; var. (*R. granulum*, *Ph.*).—*R. semistriata*, *B. M.* (*R. subsulcata*, *Ph.*).—*R. pulcherrima*, *B. M.* Some older and more produced specimens agree better with Philippi's description and figures of *R. soluta* than the species described under that name in the 'British Mollusca,' but they want the peculiar markings of *R. pulcherrima*.—*R. fulgida*, *B. M.*—*R. parva*, *B. M.* It is remarkable that Philippi did not notice the typical form, and that the other and more common form (*interrupta*) did not occur to me among so many thousands of Mediterranean *Rissoæ*.—*R. simplex*, *Ph.*; probably a variety of the last; var. (*R. pulchella*, *Ph.*): this has some analogy with *R. inconspicua* in respect of markings, but differs in the form of the spire and apex.—*R. violacea*, *Ph.*—*R. ventricosa*, *Ph.* (*R. rufilabrum*, *B. M.*).—*R. oblonga*, *Ph.* (*R. costulata*, *B. M.*); var. (*R. similis*, *Ph.*); and var. *minor*.—*R. variabilis*, v. Mühlfeld (*R. costata*, *Ph.*). The name of *costata* given to this species by Desmarest must be relinquished, as it was long previously used by Adams for the *R. exigua* of Michaud; var. : this somewhat resembles *R. labiosa* in form, but the texture, colour and markings are different.—*R. labiosa*, *B. M.* (*R. elata*, *Ph.*).—*R. auriscalpium*, *Ph.*—*R. monodonta*, *Ph.*—*R. thermalis*, (*Linn.*) *Ph.*; var. *minor* (*R.*

ulvæ, *B. M.*).—*R. cingillus*, *B. M.*—*R. rubra*, *B. M.* (*R. fulva*, *Ph.*); var. *unifasciata*.—*R. ? littorea*, *B. M.* (*Truncatella littorina*, *Ph.*).

Rissoina Bruguieri, *D' Orb.* (*Rissoa Bruguieri*, *Ph.*), *R. decussata*. Nice.—*R. Chesnelii*, Mich. Nice.—*R. marginata*, Mich. Nice.

Jeffreysia diaphana, *B. M.*

Jeffreysia cylindrica, n. s. Pl. II. f. 8, 9.

Testa longo-cylindrica, ad apicem obtusa, hyalina; anfractibus 4, brevissimis, nitidis, ultimo reliquos superante; sutura distincta; apertura ovata, subeffusa, $\frac{2}{5}$ spiræ partem æquante, margine subconnexo; umbilico angusto; long. $\frac{1}{30}$, lat. $\frac{1}{50}$ unc.æ.

Of this very minute but peculiar species I took only one specimen, by dredging in about 12 fathoms at Spezia. It approaches somewhat in form the *Chemnitzia Gulsonæ* of Clark, which I think ought to be referred to the same genus.

Skenea planorbis, *B. M.* The Mediterranean specimens, like those from Guernsey, are girdled with a single row of circular reddish-brown spots.—*S. nitidissima*, *B. M.* (*Truncatella atomus*, *Ph.*).—*S. rota*, *B. M.* Mediterranean specimens are girdled with three bands of reddish-brown, one on the outer edge or periphery, and the others on the upper and under side of each whorl; which, with the striæ, render them exquisitely beautiful objects.—*S. exilissima* (*Delphinula exilissima*, *Ph.*).

Turritella communis, *Ph. & B. M.*—*T. triplicata*, *Ph.*

Turritella ? pusilla, n. s. Pl. II. f. 10, 11.

Testa turrita, lutea vel fusca, solidula; anfractibus 12, convexiusculis, interdum varicosis, plicis 8 longitudinalibus (quarum 3 mediæ prominentiores) costellisque transversis (in ultimo anfractu 8, in penultimo 5) decussatis, in superioribus anfractibus nodulis efformatis; sutura profunda; apertura ovato-rhomboidæa, subeffusa, sextam spiræ partem æquante; long. $\frac{1}{5}$, lat. $\frac{1}{15}$ unc.æ.

In about twelve fathoms, Gulf of Spezia; not common. It has somewhat the habit of a *Cerithium*, but differs in its shorter spire, and, above all, in the form of its aperture.

Cæcum trachea, *B. M.* (*Odontidium rugulosum*, *Ph.*).—*C. glabrum*, *B. M.*

Aporrhais pes-pellicani, *B. M.* (*Chenopus pes-pellicani*, *Ph.*).—*A. desciscens* (*Chen. desciscens*, *Ph.*).

Cerithium vulgatum, *Ph.*—*C. fuscatum*, *Ph.*; var. *minor*.—*C. mammillatum*, *Ph.*—*C. reticulatum*, *B. M.* (*C. lima*, *Ph.*); var. *major*; var. β . *Ph.*—*C. angustissimum*, *Forbes* (Report on Ægean Invertebrata, 1843).—*C. adversum*, *B. M.* (*C. perversum*, *Ph.*).

Scalaria communis, *Ph. & B. M.*—*S. Turtonis* (*S. tenuicosta*, *Ph.*).—*S. pseudoscalaris*, *Ph.*—*S. pulchella*, *Ph.*

Vermetus semisurrectus, *Ph.*—*V. subcancellatus*, *Ph.*—*V. gigas*, *Ph.*—*V. glomeratus*, *Ph.*

Siliquaria anguina, *Ph.* Nice.

Eulima polita, Ph. & B. M.—*E. nitida*, Ph. (*E. polita*, var. *B. M.*).—*E. distorta*, Ph. & B. M.—*E. subulata*, Ph. & B. M.

Chemnitzia. For the sake of more convenient arrangement (this genus being otherwise perhaps too extensive), I have adopted the views of my late friend Professor Forbes, in separating this genus and *Eulimella* from *Odostomia*; although the transition from one of those so-called genera to either of the others is gradual and almost imperceptible. Adult and perfect specimens have occasionally the columellar tooth or fold. I have detected it even in *C. elegantissima* or *lactea*, as well as in *C. gracilis*, *indistincta*, and *fenestrata*. *C. elegantissima*, Ph. & B. M.; var. *costis flexuosis et dente columellari*.—*C. pusilla*, Ph. & B. M.—*C. gracilis*, Ph.: this species is very distinct in form and the want of angularity in the whorls from the preceding, with which the authors of the 'British Mollusca' supposed it to be identical. The difference is as great between these species, as between either of them and *C. elegantissima*.—*C. pallida*, Ph. (*Parthenia varicosa*, Forbes, *Æg. Inv.*).—*C. rufa*, Ph. & B. M.—*C. scalaris*, Ph. & B. M.—*C. unica* (*Aclis unica*, B. M.).—*C. fenestrata*, B. M.—*C. indistincta*, B. M.

Odostomia clathrata, B. M. A single specimen of this distinct species occurred to me at Spezia; and I observed another at the British Museum, in Mr. MacAndrew's collection from the Canaries.—*O. interstincta*, B. M. (*Rissoa suturalis*, Ph.); var. *angustior*.—*O. terebellum*, Ph. The form, disposition of the ribs, and the greater prominence of the tooth, distinguish this from the last species. It is also a British species, having been found both by Mr. Barlee and myself on the Scotch and Devonshire coasts; var. *angustior*.

Odostomia tricincta, n. s. Pl. II. f. 12, 13.

Testa brevi-fusiformis, lutea, zonis tribus angustis fuscis in ultimo anfractu (2 in penultimo et antepenultimo, 1 in proximo) ornata, solidula; anfractibus 6 (quorum 2 supremi sinistrorsum retorti) ultimo reliquos æquante, complanatis, nitidis, costis circa 20 longitudinalibus subflexuosis interdum bifidis interstitia æquantibus obsitis; sutura distincta; apertura ovato-romboidea, ad basin subeffusa, tertiam spiræ partem æquante, columella prope mediam uniplicata, labio reflexo; long. $\frac{1}{10}$, lat. $\frac{1}{25}$ unciæ.

Sestri di Levante, at the roots of *Corallina officinalis*; not common. Nice, Verany.

I also observed specimens of this prettily marked shell in Mr. MacAndrew's collection from the Canaries at the British Museum. It may possibly be the *Rissoa doliolum* of Philippi; but he does not notice the coloured bands, nor the fold on the pillar lip, and the number of ribs in his description and figure are fewer.

Odostomia excavata, B. M. (*Rissoa excavata*, Ph.).—*O. Humboldti* (*Chemnitzia Humboldti*, Ph.). Sestri di Levante; and Verany had also found it at Nice.—*O. conspicua*, B. M. My specimens, which were dredged in about 10 fathoms in the Gulf of Spezia, measured

three-eighths of an inch in length, and nearly one-sixth in their extreme breadth. A half-grown specimen is in the British Museum, among the shells collected at Lisbon by Mr. MacAndrew; and I before noticed it in the 'Annals' as an Adriatic species.—*O. acuta*, *B. M.*—*O. conoidea*, *Ph.* & *B. M.*—*O. unidentata*, *B. M.* (*Eulina monodon*, *Requien?*).—*O. Eulimoides*, *B. M.*—*O. Rissoides*, *B. M.*—*O. plicata*, *B. M.*; var. *dente inconspicuo* (*Rissoa elongata*, *Ph.*).—*O. obliqua*, *B. M.*—*O. Warrenii*, *B. M.*—*O. dolioliformis*, *B. M.*
Eulimella clavula, *B. M.*—*E. acicula*, *B. M.* (*Melania acicula*, *Ph.*).

Eulimella striatula, n. s. Pl. II. f. 14, 15.

Testa subcylindrica, aciculata, hyalina, limo partim induta; anfractibus 8-9, complanatis, ultimo tertiam spiræ partem subæquante, concentricè confertim rugoso-striatis; sutura distincta, obliqua; apertura oblonga-rhomboidea, supra acutangulata, infra latiore, subtruncata; columella flexuosa; long. $\frac{1}{10}$, lat. $\frac{1}{40}$ uncia.

I took two live specimens of this very distinct shell by dredging in about 10 fathoms at Spezia. It is more delicate than *Eulimella acicula*, and has the volutions more flattened, the suture more oblique, and the last whorl and aperture proportionably longer; and it especially differs in having distinct undulating transverse striæ. All the species of *Eulimella* exhibit under a microscope similar, but very faint, and close-set, striæ. One of the characters assigned to the genus *Eulimella* by its founder (Professor Edward Forbes) is "solid, smooth, and polished;" so that either this character must be exchanged, or the genus merged in *Odostomia* or *Chemnitzia*.

Eulimella nitidissima (*Aclis nitidissima*, *B. M.*).

Truncatella truncatula, *Ph.* (*T. Montagui*, *B. M.*); var. *costellata*.

Natica olla, *Ph.*—*N. millepunctata*, *Ph.*—*N. macilenta*, *Ph.*; var. *immaculata*.—*N. nitida*, *B. M.* (*N. Marochiensis*, *Ph.*).—*N. monilifera*, *B. M.* (*N. Guillemini*, *Ph.*).

Sigaretus haliotoideus, *Ph.*

Velutina lævigata, *B. M.*

Lamellaria perspicua, *B. M.* (*Coriocella perspicua*, *Ph.*).

Cerithiopsis tubercularis (*C. tuberculare*, *B. M.*, *Cerithium pygmæum*, *Ph.*).

Tritonium cutaceum, *Ph.*—*T. nodiferum*, *Ph.*

Cassis saburon, *Ph.*—*C. undulata*, *Ph.*

Cassidaria Tyrrhena, *Ph.*; var. (*C. Echinophora*, *Lam.*).

Ranella reticularis, *Ph.* (*R. gigantea*, *Lam.*).

Murex tetrapterus, *Ph.*—*M. Brandaris*, *Ph.*—*M. distinctus*, *Ph.*—*M. cristatus*, *Ph.*; var.—*M. Edwardsii*, *Ph.*—*M. corallinus*, *B. M.* (*Fusus corallinus*, *Ph.*).—*M. rudis* (*F. rudis*, *Ph.*).—*M. erinaceus*, *Ph.* & *B. M.*—*M. trunculus*, *Ph.*

Lachesis minima, *B. M.* (*Buccinum minimum*, *Ph.*); var.—*L. mammillata* (*Nesæa mammillata*, *Risso*, *Bucc. Folineæ*, *Ph.*). Nonne præcedentis varietas?

Pollia D'Orbigny (*Buccinum D'Orbigny*, *Ph.*).—*P. pusio* (*Bucc. pusio*, *Ph.*).

Nassa reticulata, B. M. (*Buccinum reticulatum*, Ph.); var. (*Bucc. prismaticum*, Ph.).—*N. variabilis* (*Bucc. variabile*, Ph.); varieties δ & ϵ , Ph.—*N. incrassata*, B. M. (*Bucc. Ascanias*, Ph.).—*N. pygmæa*, B. M. (*Bucc. asperula*, var. Ph.); var. *sine varicibus mediis*.—*N. mutabilis* (*Bucc. mutabile*, Ph.).—*N. Neritea* (*Bucc. Neriteum*, Ph.); var. *minor*.—*N. corniculum* (*Bucc. corniculum*, Ph.); var. *minor*, γ . Ph.—*N. scripta* (*Bucc. scriptum*, Ph.); var. β . Ph. & var. *decollata*.
Buccinum minus, Ph.

Fusus corneus, Ph.—*F. craticulatus*, Ph.—*F. Syracusanus*, Ph.—*F. rostratus*, Ph.

Fasciolaria lignaria, Ph. (*F. Tarentina*, Lam.).

Mangelia reticulata (*Pleurotoma reticulatum*, Ph.).—*M. scabra* (*P. scabrum*, Jeff. in Ann. Nat. Hist. 1847). The discovery of a Mediterranean specimen with the last, to which it bears a closer affinity than to *M. linearis*, confirms the impression I formed some years ago that this is a distinct species. It is not, as the authors of the 'British Mollusca' supposed, the southern or purple-tipped form of *M. linearis*.—*M. linearis*, B. M. (*P. lineare*, Ph.).—*M. purpurea*, B. M. (*P. Philberti*, Ph.); var. *minor*.—*M. gracilis*, B. M. (*P. gracilis*, Ph.).—*M. nebula*, B. M. (*P. Ginannianum*, Ph.).—*M. brachystoma* (*P. brachystoma*, Ph.).—*M. costata*, B. M. (*P. tæniatum*, Ph.).—*M. rugulosa* (*P. rugulosum*, Ph.); var. *minor*.—*M. Vauquelini* (*P. Vauquelini*, Ph.).—*M. cærulans* (*P. cærulans*, Ph.).—*M. costulata* (*P. costulatum*, Ph.).—Judging from the solitary specimen which I took of this, it is more nearly allied to our *Mangelia turricula* than to the *Pleurotoma striolatum* of Scacchi, to which the authors of the 'British Mollusca' considered that it very closely approached.—*M. Leufroyi*, B. M. (*P. Leufroyi*, Ph.).—*M. attenuata*, B. M. (*P. attenuatum*, Ph.).—*M. lævigata* (*P. lævigatum*, Ph.).

Columbella rustica, Ph.

Mitra ebenus, Ph.—*M. lutescens* (var. *lactea*), Ph.—*M. Savignyi*, Ph.

Conus Mediterraneus, Ph.

Cypræa Europæa, B. M. (*C. Coccinella*, Ph.).—*C. pyrum*, Ph. (*C. rufa*, Lam.).—*C. lurida*, Ph.

Ovula carnea, Ph.—*O. spelta*, Ph.

Ringicula auriculata, Ph.

Marginella miliacea, Ph.—*M. minuta*, Ph. The number of folds on the pillar lip varies from four to six.—*M. clandestina*, Ph.—*M. secalina*, Ph. Nice.

Gasteropoda Opisthobranchiata.

Tornatella fasciata, Ph. & B. M.

Cylichna truncata, B. M. (*Bulla truncata*, Ph.).—*C. mammillata*, B. M. (*B. mammillata*, Ph.); var. *B. M.* (*truncatula*, Jeffr. in 'Annals'), *spira non exserta*. This still appears to me a distinct species. It is common at Spezia in muddy ground from eight to ten fathoms.—*C. strigella*, B. M. Common at Spezia with the last.—*C. umbilicata*, B. M.

Cylichna fragilis, n. s. Pl. II. f. 16, 17.

Testa cylindrica, nitidissima, hyalina, ad apicem constricta et longitudinaliter striatula, aliter lævissima; spira laxè involuta; vertice parum conspicuo, oblique attenuato; apertura superne angusta, infra dilatata, truncata; long. $\frac{1}{15}$, lat. $\frac{1}{30}$ uncia.

A solitary example of this remarkable shell occurred to me in dredging at Spezia, in about 10 fathoms; and Mr. MacAndrew has also taken it on the coast of Spain. It has somewhat the habit of an *Akera*.

Akera bullata, B. M. Genoa.

Bulla Hydatis, Ph. & B. M.; var. minor et subglobosa; var. β . Ph., minor, viridula et lævissima.—*B. ovulata*, Ph., Spezia; and I also noticed a specimen in Mr. MacAndrew's collection in the British Museum under the name of "*Cylichna strigella*." As the only figure which has been published of this species is in a work little known (Brocchi, *Conchiologia Fossile Subapennina*, 1814), and is not, to my mind, satisfactory, I have added another figure of it (18, 19) to Pl. II.

Scaphander lignarius, B. M. (*Bulla lignaria*, Ph.).

Scaphander gibbulus, n. s. Pl. II. f. 20, 21.

Testa ovata, turgida, nitidissima, hyalina, utrinque striis circiter 10 flexuosis versus extremitates approximantibus concentricè insculpta, in medio lævissima; vertice subtruncato, umbilicato, ad marginem exteriorem incrassato; apertura in medio coarctata, superne angulata patula, subtus canaliculata; columella ad basin uniplicata; long. $\frac{1}{5}$ fere, lat. $\frac{1}{10}$ uncia.

In from 10 to 12 fathoms, Bay of Spezia; not uncommon. The animal is flesh-coloured.

Philine aperta, B. M. (*Bullæa aperta*, Ph.).—*P. catena*, B. M. Nice.

Aplysia depilans, Ph. (*A. hybrida*, B. M.).—*A. punctata*, Ph.—*A. depressa*, Cantraine, and other species which have been published in the 'Journal de Conchiliologie' for 1853.

Pleurobranchus aurantiacus, Ph.—*P. stellatus*, Ph., and other species, for which reference must also be had to the last-mentioned publication.

Umbrella Mediterranea, Ph. Nice.

Cephalopoda Dibranchiata, or Cuttles.

Argonauta Argo, Ph.

Sepia officinalis, Ph. & B. M., and other species, which have been so admirably described and figured by Verany in his splendid work.

The total number of species named in the above lists amounts to 375.